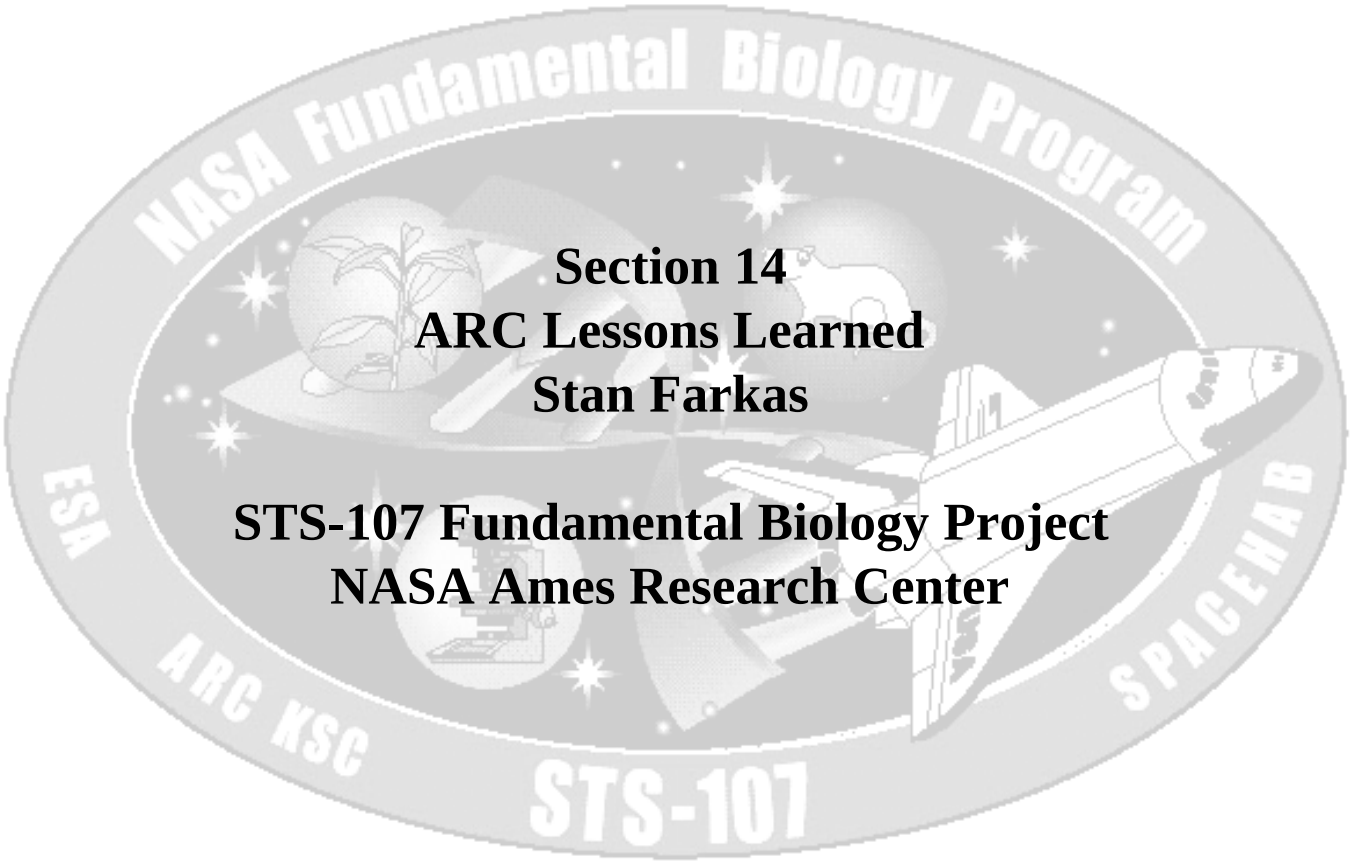


Section 14
ARC Lessons Learned
Stan Farkas

STS-107 Fundamental Biology Project
NASA Ames Research Center

ARC Lessons Learned

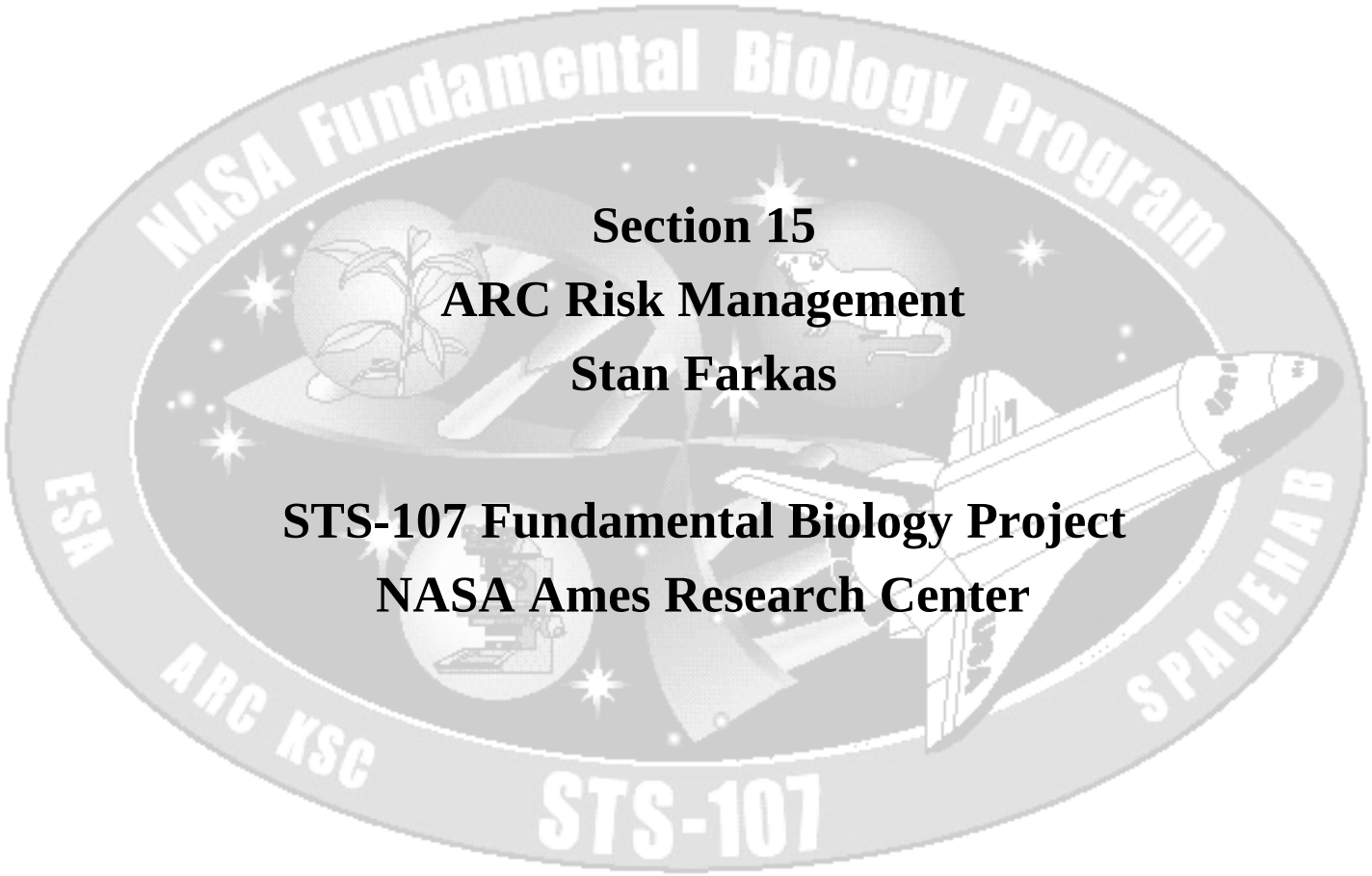
Ames Research Center

- **Approach**
  - **Database developed to catalogue lessons learned from:**
    - **Neurolab**
    - **STS-95**
    - **NIH.R4**
    - **Recent reviews and recommendations**
  - **Lessons will be reviewed and catalogued by impact area, appropriateness to STS-107 Project and recommended actions.**
  - **The database will be updated and actions to be implemented will be tracked.**
  - **Lessons from STS-107 will be added to the database and the file will be made available to future project teams.**

ARC Lessons Learned

- **Major findings**
  - **At this time the Lessons Learned electronic database is still under review by the team.**

- **Implementation of Findings**
  - **Once actions are identified the responsible discipline will provide regular status to Project Management until the action has been closed.**



Section 15
ARC Risk Management
Stan Farkas

STS-107 Fundamental Biology Project
NASA Ames Research Center

ARC Risk Management

- **Risks include Schedule, Cost, Technical, and Safety**
- **The Risk management process is defined in the STS-107 Fundamental Biology Project Risk Management Plan**
  - **Risks will be identified for all areas of the project.**
  - **Risks will be analyzed for probability of occurrence and severity/impact on the project. Related risks will be grouped, and prioritized.**
  - **A plan of action and schedule will be developed for mitigating or resolving each risk.**
  - **Each risk will be tracked and reviewed periodically to determine if the risk has been resolved, eliminated, or controlled.**

- **Methodology**
  - **Risk severity and probability attribute definitions (STS-107)**
    - **Severity**
      - **I- Catastrophic**
        - **Schedule: Major slip in milestone schedule**
        - **Cost: ≥ 25% increase to project cost; > 25% budget cut**
        - **Technical: Unable to achieve all project requirements and/or some loss of project scope or goals.**
        - **Safety: Loss of life and/or disabling injury**
      - **II - Critical**
        - **Schedule: Moderate slip in milestone schedule**
        - **Cost: 10% ≥ increase to project cost < 25%; 10% > budget cut < 25%**
        - **Technical: Unable to achieve most project requirements and/or loss of most project scope and goals**
        - **Safety: Severe but recoverable injury**
      - **III - Negligible**
        - **Schedule: Insignificant slip in milestone schedule**
        - **Cost:< 10% increase to project cost**
        - **Technical: No or minor loss of project requirements and/or no loss to project scope or goals**
        - **Safety: No injury**

- **Methodology (Continued)**
  - **Probability of Occurrence**
    - **A-Probable Highly likely to happen**
    - **B-Infrequent Could happen**
    - **C-Remote Highly unlikely to happen**

- **Methodology (Continued)**
  - **RISK ASSESSMENT MATRIX**

Probability	Severity I	Severity II	Severity III
A	H	H	M
B	H	M	L
C	M	L	L

H - High Risk **M - Medium Risk** **L - Low Risk**

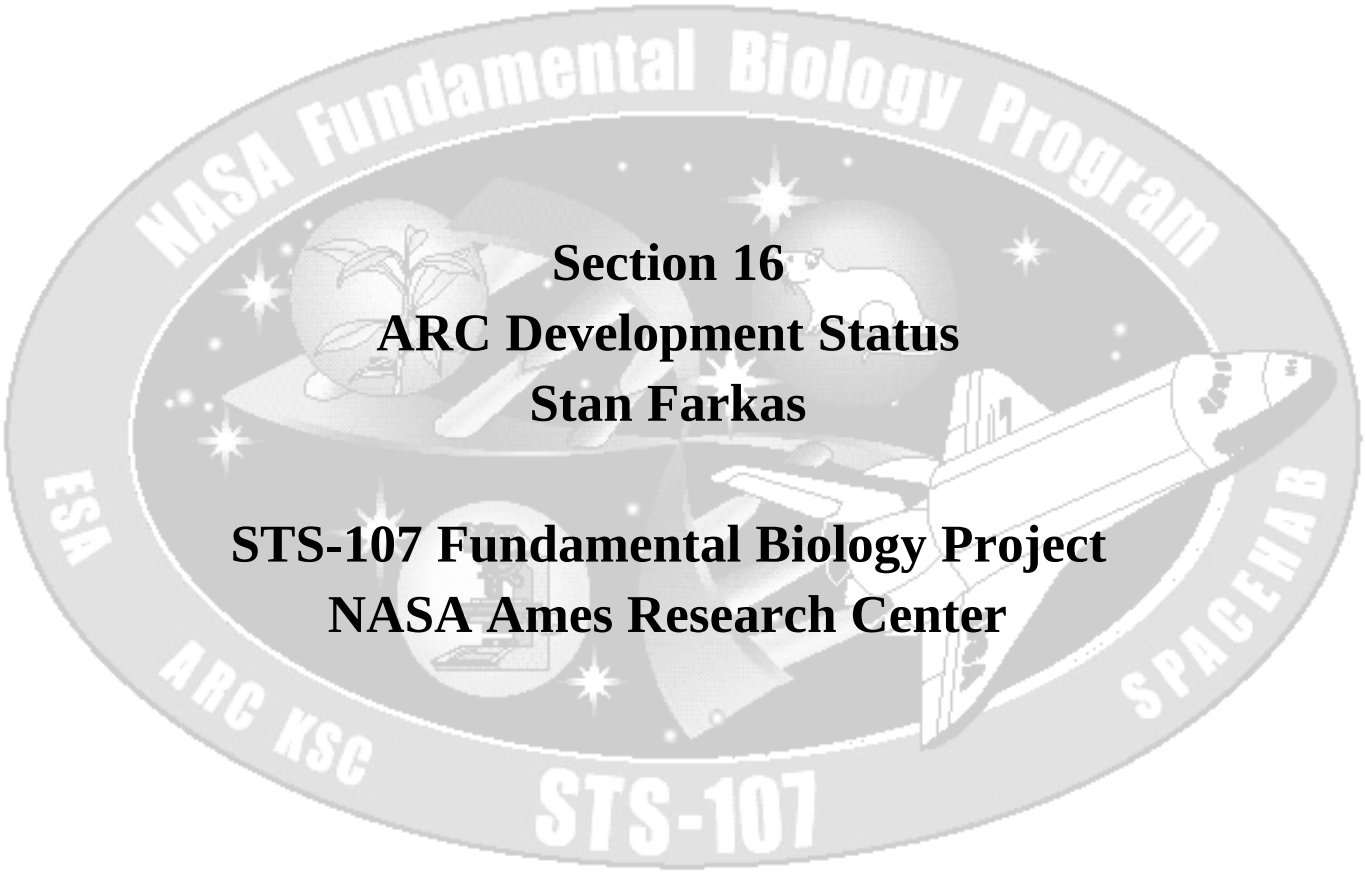
A - Probable **B- Infrequent** **C - Remote**

I - Catastrophic **II - Critical** **III - Negligible**

ARC Risk Management

Ames Research Center

- **Risk Management Results**
  - **The STS-107 Fundamental Biology Project Risk Management Plan has been baselined**
  - **Risk assessment has been started**
    - **Several high and medium risk items have been identified in the areas of project management, science, operations, and crew training**
    - **We are in the process of analyzing these risks and defining the approach for resolution.**
    - **Some mitigation has been implemented**



Section 16
ARC Development Status
Stan Farkas

STS-107 Fundamental Biology Project
NASA Ames Research Center

ARC Development Status

- **Schedule**
  - **All SPACEHAB milestones and deliverable dates have been met based on STS-107 Schedule dated 4-21-00 and STS-107 Preliminary Training Schedule Rev. B (Launch 2-22-01)**
  - **Uncertain of several tasks on STS-107 schedules.**
    - **Information in the updated training questionnaire submitted to MMO is not reflected in the STS-107 Preliminary Training Schedule Rev. B**
    - **The requirement for training dry-runs is not reflected in the STS-107 Preliminary Training Schedule Rev. B**
  - **The Inflight Refill Unit and CO2 system training hardware will not be available to support Hands-on Training per STS-107 Preliminary Training Schedule Rev. B (Launch 2-22-01)**

- **Schedule (Continued)**
  - **Some internal project planning documents were finished late or are currently under development.**
    - **Due to:**
      - **Addition of Euthanasia requirements**
      - **Change of location from Middeck to SPACEHAB**
      - **Change of PI complement**
    - **Requires addition of hardware to support changes**
      - **CO_2 system**
      - **Inflight Refill Unit and contingency back-up unit**
    - **Impacts**
      - **Hardware Development**
      - **Operations**
      - **Engineering/Stowage**

- **Budget**
  - **Budget submitted for Program Operating Plan 2000. SL approval to proceed for planning purposes until finalized**
  - **Currently working to stay within FY 2000 and FY 2001 Guidelines**

- **Deliverables - Documents baselined and delivered**
  - **Phase II Flight Safety Data Chapter (ESA Biopack)**
  - **Section II of ESA Pyle ADP**
  - **Phase II Flight Safety Data Package (AEMs)**
  - **Phase II Ground Safety Data Package (AEMs)**
  - **Experiment Requirements Document (Delp)**
  - **Experiment Requirements Document (Holstein)**
  - **Experiment Requirements Document (Gabrion)**
  - **Experiment Requirements Document (Pyle)**

- **Project Requirements**
  - **Project Management Requirements**
    - **Sufficient resources (funds and personnel) shall be provided to maximize probability of mission success:**
      - **Status: Sufficient funds and personnel available for FY2000**
    - **Project planning shall be conducted to maximize probability of mission success.**
      - **Status: Completed Project Schedules, Risk Management Plan; remaining products in progress**

- **Project Requirements (Continued)**
  - **Science Requirements**
    - **Experiment designs shall be defined**
      - **Status: Complete - Experiment Requirements Document baselined**
    - **Experiment design shall be approved**
      - **Status: ARC Life Sciences Division Project Control Board review 5/18/00.**
    - **On-Orbit operations shall be conducted**
    - **Experiment data shall be disseminated to PI teams**

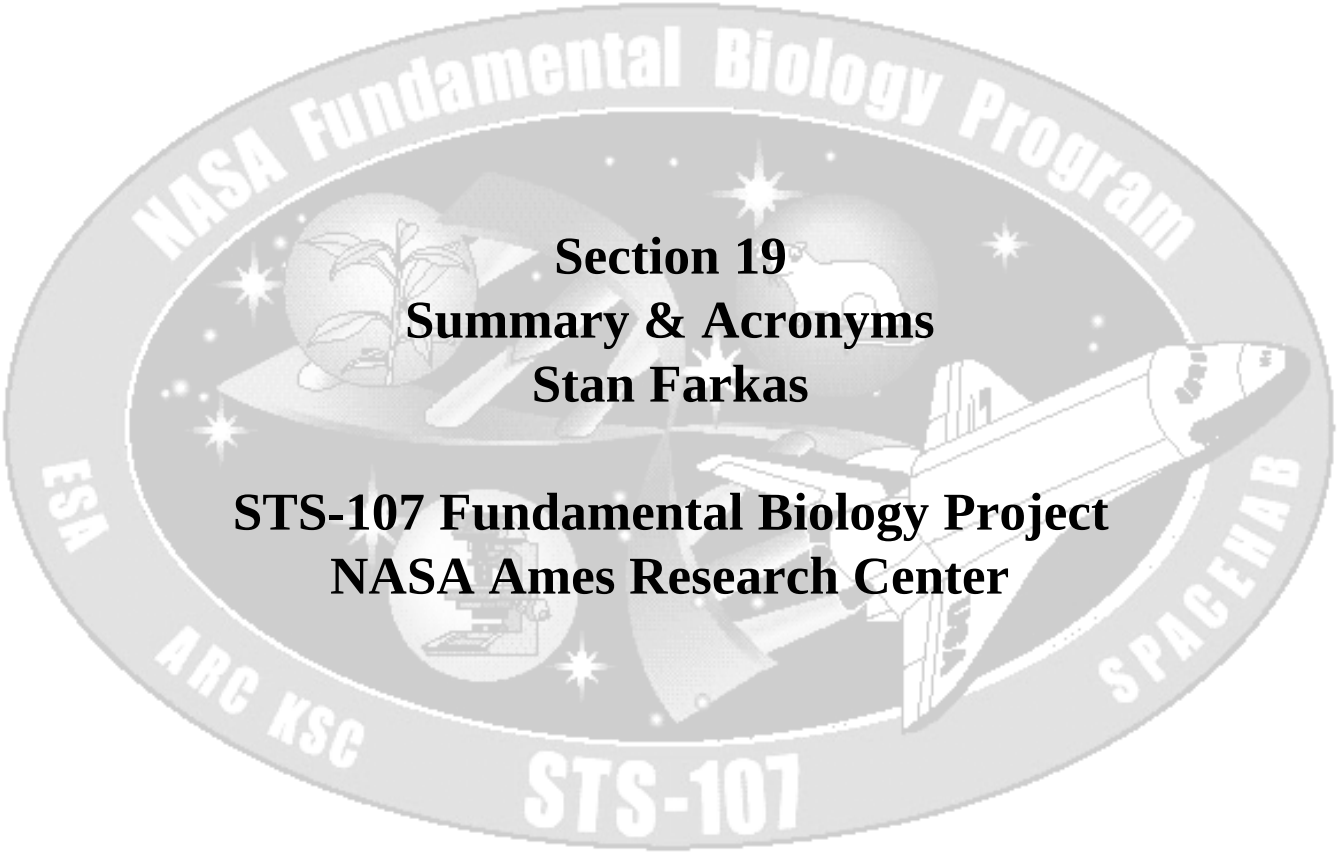
- **Project Requirements (Continued)**
  - **AEM/Biopack Hardware Requirements**
    - **AEM H/W design and operations shall meet science requirements as defined in individual Experiment Requirements Documents.**
      - **Status: Work in progress**
    - **AEM CO_2 System shall provide the crew with a safe and rapid means of euthanizing rodents in the event of an animal crisis.**
      - **Status: Work in progress**
    - **Biopack hardware shall meet science requirements as defined in the ERD**
      - **Status: Work in progress**

- **Project Requirements (Continued)**
  - **Operations Requirements**
    - **Hardware shall be fabricated, modified, and refurbished to meet objectives identified in the Experiment Requirement Documents.**
      - **Status: Work in progress**
    - **Hardware shall be prepared to support crew training.**
      - **Status: Schedule impacted by hardware modifications**
    - **Training of crew shall be supported by STS-107 Fundamental Biology Project personnel.**
      - **Status: Schedule impacted by hardware modifications**
  - **Safety Requirements**
    - **The identification and mitigation of hazards shall be accomplished to achieve mission success for the STS-107 SPACEHAB mission.**
      - **Status: Work in progress**

ARC Development Status

Ames Research Center

- **Challenges**
  - **Indeterminate status of two PIs.**
    - **Chapes is being considered for manifesting and is an unknown risk for support at this late date.**
    - **Vandenburgh is on reserve and risk of supporting manifesting increases with time.**
  - **Change in scope of project by inclusion of CO_2 system and Inflight Refill Unit and back-up unit.**
    - **Significant increase in stowage requirements and cost.**
    - **Meeting SPACEHAB deliverables.**



Section 19
Summary & Acronyms
Stan Farkas

STS-107 Fundamental Biology Project
NASA Ames Research Center

Acronym list

ACOS- AEM CO2 System

AEM - Animal Enclosure Module

ARC- Ames Research Center

ASSY-Assembly

ARF- Aquatic Research Facility

ATP- Adenosine Triphosphate

BRIC- Biological Research In Cannisters

BRIC-LED- Biological Research in Canisters-Light Emitting Diode

cCMP-Guanosine Cycline Monophoshate

CCM- Cell Culture Module

CDMS- Command Data Management System

CDR- Critical Design Review

CIS-Camera Illumination System

CM-Centimeter

CO2-Carbon Dioxide

CRIT- Criteria

CSA- Canadian Space Agency

CSF- Cerebral Spinal Fluid

CWR-Collapsible Water Reservoir

DIAM-DIAMETER

DIS-Digital Imagery System

EEOM- Early End of Mission

ELISA- Enzyme-linked immunosorbent assay

ERD-Experiment Requirements Document

ESA- Europen Space Agency

EST- Experiment Sequence Test

EUE- Experiment Unique Equipment

EVT- Experimental Verification Test

FDS- Fixative Delivery System

FAM- Familiarization (BRIEFING)

FD- Flight Day

FO- Functional Objective

FPU-Fluid Pumping Unit

FRESH- Fundamental Rodent Experiments Supporting Health

FRR- Flight Readiness Review

FTR- Facilities Trial Run

g- Gravity

GCU- Generic Containment Unit

GES- Generic External Shell

HGMF- High Gradient Magnetic Fields

H/W - Hardware

Acronym list

IACUC- Intstitutional Animal Care & Use Committee

ICD- Interface Control Document

IN-Inch

IRB- Institutional Review Board

IRU-Inflight Refill Unit

KSC- Kennedy Space Center

Launch - Launch Minus

L+ Launch Plus

LIOH-Lithium Hydroxide

LIRD- Logisctics Integrated Requirements Document

LOE- Level of Effort

M-Meter

MEDUSA- Micro-Effusion Delivery Unit for Space Applications

MET- Mission Elapsed Time

MFA -Magnetic Flux Apparatus

MFC- Magnetic Field Chamber

MLE-Middeck Locker Equivalent

MMO- Mission Management Office

MOU-Memoranum of Understanding

MSDS-Material Safety Data Sheets

N/A-Not Applicable

NaK- Sodium Potassium

NCR-Non-Conformance Reports

NET- No Earlier Than

NOS- Nitric Oxide Synthase

OBJ- Objective

OSRF- Oceaneering SPACEHAB Refrigerator Freezer

PDFU's- Petri Dish Fixation Units

PCB-Project Control Board

PDR- Preliminary Design Review

PI- Principal Investigator

POP- Program Operating Plan

PMR-Payload Management Review

PSR- Pre-Ship Review

PSRP-Payload Safety Review Panel

PSI-Pounds Per Square Inch

PSIG-Pounds Per Square Inch Gauge

PT-Process Traveler

PWQ-Process Waste Questionnaire

PVT- Payload Verification Test

Acronym list

QD-Quick Discount

QTY-Quantity

RPO- Research Program Office

R+ Recovery plus

SL- Life Science Division of Ames Research Center

SS&MA- System Safety and Mission Assurance

SORG-Shuttle Orbiter Repackaged Galley.

SPF- Specific Pathogen Free

STS- Space Transport System

SVT-Science Verification Test

SWG- Science Working Group

TAP- Test & Assembly Procedure

TBD-To be determined

TOP-Test Operating Procedure

VDC- Volt Direct Current

VIV- Vivarium

WBS- Work Breakdown Structure